Electronic Version
Stylesheet Version v1.1.1

Claims

[c1] What is claimed is:

1. A light source testing system comprising:
a light source for generating a light to form an image;
an image capturing apparatus for capturing an image occupying a plurality of pixels of the image capturing apparatus ; and
an image processing apparatus for calculating a plurality of gray levels of the plurality of pixels, and calculating a characteristic parameter of the light source according to the plurality of gray levels.

[c2] 2. The system of claim 1, wherein the light source testing system further comprises an image forming apparatus installed between the light source and the image capturing apparatus, and the image capturing apparatus captures the image resulted from the image forming apparatus.

[c3] 3. The system of claim 2, wherein the image forming apparatus comprises a screen for the light to be projected on, and the image capturing apparatus captures the image by detecting the light penetrating the screen.

[c4] 4. The system of claim 3, wherein the image forming apparatus further comprises an image forming lens for the light to be focused on the screen.

[c5] 5. The system of claim 1, further comprising a clamping device for clamping the light source.

[c6] 6. The system of claim 5, wherein the clamping device comprises an aperture for the light to pass through, and a shape of the image on the image forming apparatus is determined by the shape of the aperture.

[c7] 7. The system of claim 1, further comprising a shading plate installed in front of the image forming apparatus for shading unnecessary ambient light.

[c8] 8. The system of claim 1, wherein the image capturing apparatus is a CCD photo-sensor or a CMOS photo-sensor.

[c9] 9. The system of claim 1, wherein the light source is a lamp comprising a burner and a reflector for reflecting the light generated by the burner.

[c10] 10. The system of claim 1, wherein the image capturing apparatus further comprising a filter for reducing an intensity of the light incident on the image capturing apparatus.

[c11] 11. A light source testing method comprising:
(a) providing a light source for forming an image;
(b) using an image capturing apparatus for capturing an image occupying a plurality of pixels of the image capturing apparatus; and
(c) using an image processing apparatus for calculating a plurality of gray levels of the plurality of pixels, and calculating a characteristic parameter according to the plurality of gray levels.

[c12] 12. The method of claim 11, wherein step (b) further comprises another step (b') to provide an image forming apparatus installed between the light source and the image capturing apparatus, and the image capturing apparatus captures the image resulted from the image forming apparatus.

[c13] 13. The method of claim 11, wherein the image has an image center b and an image edge at a distance of D1 from the image center b, and step (c) further comprises:
(d1) selecting a first predetermined gray level G1, and defining a first light source testing area and a light source center c as follows:
the first light source testing area being an area formed by pixels with gray level larger than the first predetermined gray level G1 from a plurality of pixels the image

occupied;

the light source center c being the center of the first light source testing area; and

(d2) defining the distance between the light source center c and the image center b as D2 ; calculating a center deviation D2/D1 to detect the uniformity of the light source.

[c14] 14. The method of claim 11, wherein step (c) further comprises:

(e1) selecting a second predetermined gray level G2, and calculating the area Q2 of a second light source testing area formed by pixels with gray level larger than the second predetermined gray level G2 from a plurality of pixels the image occupied;

(e2) calculating a maximum gray level GX1, and a gray level difference h=GX1-G2 between the second predetermined gray level G2 and the maximum gray level GX1; and

(e3) detecting the brightness of the light source by a product V=h*Q2 of the gray level difference h and the area Q2.

[c15] 15. The method of claim 11, wherein step (c) further comprises:

(f1) selecting a third predetermined gray level G3, and defining the area Q3 of a third light source testing area

formed by pixels with gray level larger than the third predetermined gray level G3 from a plurality of pixels the image occupied;

(f2) calculating areas of a plurality of rectangles with four sides tangent with the third light source testing area;

(f3) selecting a specific rectangle having a minimum area among the plurality of rectangles, and defining a shorter side of the specific rectangle as X, a longer side as Y; and

(f4) defining a ratio of sides R1, a ratio of areas R2, and an image shape corresponding value S to detect uniformity of the light source as follows:

R1=X/Y;

R2=(Q3/(X*Y));

S=R1*R2.

[c16] 16. The method of claim 11, wherein step (c) further comprises:

(g1) calculating an average gray level I according to the plurality of gray levels of the plurality of pixels; and

(g2) detecting the brightness of the light source by the average gray level I.

[c17] 17. The method of claim 11, wherein the image has an image center b and an image edge at the distance of D1 from the image center b, and step (c) further comprises:

(h1) selecting a predetermined gray level G, and defining

a maximum brightness area and a light source center c as follows:

the maximum brightness area being an area formed by pixels with gray level larger than the predetermined gray level G from the plurality of pixels the image occupied; the light source center c being the center of the maximum brightness area; and

(h2) defining the distance between the light source center c and the image center b as D2 to calculate a center deviation D2/D1;

(h3) calculating an area Q' of the maximum brightness area;

(h4) calculating a maximum gray level GX of the plurality of pixels, and a gray level difference h'=GX-G between the predetermined gray level G and the maximum gray level GX;

(h5) calculating a product V'=h'*Q' of the gray level difference h' and the area Q';

(h6) calculating areas of a plurality of rectangles with four sides tangent with the maximum brightness area;

(h7) selecting a specific rectangle having a minimum area among the plurality of rectangles, and defining a shorter side of the specific rectangle as X, a longer side as Y;

(h8) defining a ratio of sides R1, a ratio of areas R2, and an image shape corresponding value S to detect unifor-

mity of the light source as follows:

R1=X/Y;

R2=(Q3/(X*Y));

S=R1*R2.

[c18] (h9) calculating the average gray level I according to the plurality of gray levels of the plurality of pixels; and

(h10) evaluating brightness and uniformity of the light source by calculating a P value as follows:

P=(1-D2/D1)*V'*S*I.

[c19] 18. The method of claim 17, wherein the smaller the center deviation D2/D1 is, the larger the P value is, and the more uniform the light source is.

[c20] 19. The method of claim 17, wherein the closer to 1 the image shape corresponding value S is, the larger the P value is, and the more uniform the light source is.

[c21] 20. The method of claim 17, wherein the larger V' or I is, the larger the P value is, and the brighter the light source is.